

## OBSERVATIONS ON THE EARLY LIFE HISTORY STAGES OF *NOTADEN BENNETTII* IN THE CHINCHILLA AREA OF SOUTHERN QUEENSLAND

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Eggs, larvae and metamorphs of *Notaden bennettii* were observed in natural pools in the Chinchilla area, southeast Queensland between February and March 1994. The observations suggest that *N. bennettii* has some interesting behavioural and morphological characteristics that are absent or rare in other Australian anurans. □ *Notaden bennettii*, life history, southeast Queensland.

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*Notaden bennettii* is a common frog found over a large area of inland eastern Australia (Cogger, 1992). However there is little information on the early life history stages of this species. We report here on observations of the eggs, larvae and metamorphs of *N. bennettii* made in the Chinchilla area of southern Queensland.

Observations were made at a site within the Barakula State Forest, approximately 40km north of Chinchilla in southern Queensland. Vegetation in the area is mainly open woodland dominated by white cypress (*Callitris glauca*). Observations were made in situ, or on live individuals transported to the laboratory. Descriptive terminology for tadpoles follows Altig (1970) and the staging system used is from Gosner (1960). Measurements of tadpoles were made to the nearest 0.5mm under a dissecting microscope, and metamorphs were measured using dial calipers. Water temperatures were recorded with maximum-minimum thermometers.

A number of permanent and temporary water bodies were monitored for calling males, eggs, larvae and metamorphs approximately once per week from November 1994 to March 1995. *Notaden bennettii* were heard calling on January 30, February 8 and February 14. Amplexed pairs were located on February 14 following 70mm of rain in the previous 48 hours. Amplexus was pelvic and pairs were seen in shallow temporary pools (10-20cm deep). Egg laying was not observed, but 15 egg masses were noted in four separate pools the following morning. Each mass was oval in shape and measured approximately 10x6cm. Masses were free floating, possibly due to a number of air bubbles distributed throughout the mass, and contained approximately 500 eggs in individual jelly capsules. In 13 of the 15 egg

masses a 2-3cm wide band of vegetation (mainly dead Cypress needles) was found around the perimeter of the egg mass (Fig. 1). The remaining two masses had only small amounts of vegetation around their perimeters. Because egg laying was not observed it is not clear whether each mass represents one clutch, and if adults placed the vegetation around the egg mass or if vegetation accumulated around the egg mass as it drifted in the pool. However, the small interval between observing amplexus and resulting egg masses (<12h) and the consistent arrangement of vegetation suggest that the vegetation was placed around the egg mass, perhaps to act as a barrier against egg predators.

Embryos in natural pools had hatched by 1200 on February 17 (approximately 60h). Embryos transported to the laboratory had reached stage 16

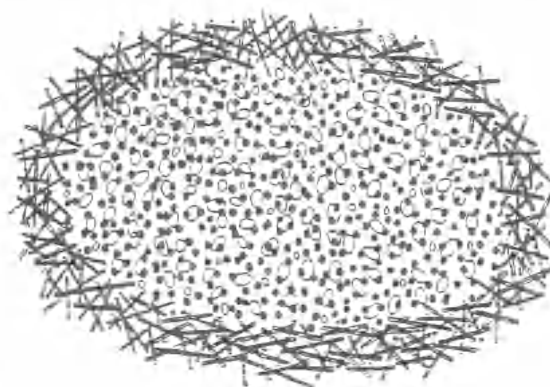


FIG. 1. Typical egg mass of *Notaden bennettii*. Masses measured approximately 10x6cm.

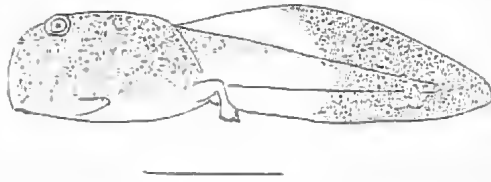


FIG. 2. Lateral view of a stage 37 *Notaden bennettii* tadpole. Scale bar = 10mm.

after approximately 36 hours, and stage 20 after approximately 60 hours. Temperature was not controlled during this period, but ranged between 20° and 30°C. Stage 26 tadpoles ranged in length from 7.5 to 10.0mm, and maximum length attained was 38.0mm (at stage 40). A stage 37 tadpole is illustrated in Fig. 2. Ratios of body proportions were body length : total length = 0.42 (n = 20), body width : body length = 0.63 (n = 10), and body depth to body width = 0.61 (n = 10). Eyes were dorsal and the mouth was orientated ventrally. There were three upper and three lower rows of labial teeth with the formula 3(2-3)/3, with the A2 gap being narrow and the A3 gap wide (Fig. 3). Marginal papillae had an anterior gap. The anus was median and the spiracle was sinistral, located ventrolaterally and orientated posteriorly. Tadpoles between stages 27 and 38 generally had a small pale spot mid-dorsally. The typical *N. bennettii* back pattern became evident at stage 37 to 38. A darkened posterior tail section developed from a slight difference in the distribution of dark pigment at stages 27 to 30, to a

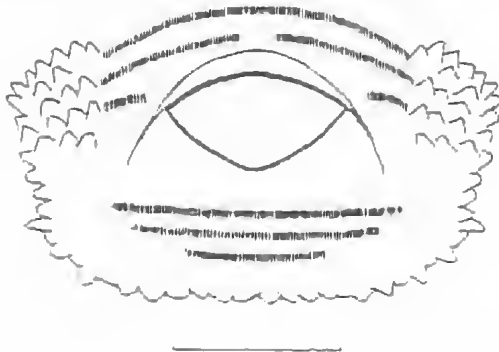


FIG. 3. The oral disc of a stage 37 *Notaden bennettii* tadpole. Scale bar = 1mm.

distinct dark posterior section in tadpoles beyond stage 36 (Fig. 2). Dark tail tips, with adjacent light areas, may function to misdirect the attack of predators (Altig & Channing, 1993), especially odonate naiads (Caldwell, 1982). Many tadpoles from natural pools had tail damage consistent with attack by odonates, and odonates were common in pools with *N. bennettii*.

In the field tadpoles were noted in the shallow water at the edge of pools at all times of the day. Recently metamorphosed individuals ranged in size from 11.0 to 14.9mm (mean = 12.7, n = 18). Metamorphs were noted near pools from February 28 to March 14. The length of the larval period in natural ponds is difficult to determine because pools with tadpoles of known age dried before individuals metamorphosed. Water temperatures in these pools ranged from 19° to 36°C. Some larvae in an experimental pond reached metamorphosis in 50 days (temperature range 19° to 36°C.). However, egg and larval period may be as short as 28 to 30 days if eggs were laid when frogs were first heard calling (January 30) and the metamorphs emerging from those eggs were the ones noted on February 28.

Metamorphs were active during the day and appeared to bask in sunny positions on the damp substrate. The meat ant, *Iridomyrmex purpureus*, was seen preying on some metamorphs. Other anuran species, noted as either calling males or as larvae, that used the same water bodies as *N. bennettii* were *Litoria alboguttatus*, *L. fallax*, *L. latopalmata*, *L. peronii*, *L. rubella*, *Cyclorana cultripes*, *Limnodynastes ornatus*, *L. tasmaniensis*, *L. terraereginae*, *Crinia parinsignifera* and *Uperolea rugosa*.

Slater & Main (1963) described the tadpole of *Notaden nicholli*. However, information on the life history of the genus *Notaden* is limited. The observations presented here suggest that *Notaden bennettii* has some interesting behavioural (egg laying behaviour) and morphological (tail colour pattern) characteristics that are absent or rare in other Australian anurans.

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